REMARKS

(I) The state of the art and the essential features and advantages of the present invention

Before specifically addressing the Examiner's rejections raised in the outstanding Office Action, it is believed that the following background information should be considered in order to shed a proper light on the development of the present invention and the essential features and advantages thereof.

As described in the present specification under "Prior Art", with respect to a shaped article containing a hydrogenated copolymer which is obtained by hydrogenating an unhydrogenated copolymer comprising vinyl aromatic monomer units and conjugated diene monomer units, it is desired to impart thereto flexibility, low temperature characteristics (such as flexibility at low temperatures), shock-absorbing property (low impact resilience) and compression set resistance, so that the shaped article can be advantageously used as a shock-absorber or the like.

In this situation, the present inventors have made extensive and intensive studies with a view toward developing a shaped article containing the above-mentioned hydrogenated copolymer, wherein the shaped article exhibits excellent properties with respect to flexibility, low temperature characteristics (such as flexibility at low temperatures), shock-absorbing property (low impact resilience) and compression set resistance. As a result, it has unexpectedly been found that such an excellent shaped article can be realized by a polymer foam as defined in claim 1 of the present application. For easy reference, claim 1 of the present application is reproduced below.

> 1. A polymer foam comprising a plurality of cells defined by cell walls which constitute a polymer matrix,
>
> said polymer matrix being comprised of:
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> 5 to 100 parts by weight, relative to 100 parts by weight of the total of components (A) and (B), of (A) a hydrogenated copolymer obtained by hydrogenating an unhydrogenated copolymer, said unhydrogenated copolymer being a block copolymer containing at least one copolymer block S comprised of vinyl aromatic monomer units and conjugated diene monomer units and at least one homopolymer block H of vinyl aromatic monomer units, wherein said at least one copolymer block S has a vinyl bond content of from 5 % to less than 40 % as measured with respect to conjugated diene monomer units, wherein said unhydrogenated copolymer is at least one polymer selected

from the group consisting of copolymers which are, respectively, represented by the following formulae (2) to (6) and (8) to (10):

(2) S-H,

(3) S-H-S,

(4) $(S\text{-}H)_m\text{-}X$,

(5) $(S\text{-}H)_n\text{-}X\text{-}(H)_p$,

(6) H-S-H,

(8) H-S-E,

(9) E-S-H-S and

(10) $(E\text{-}S\text{-}H)_m\text{-}X$

wherein each S independently represents a copolymer block comprised of vinyl aromatic monomer units and conjugated diene monomer units, each H independently represents a homopolymer block of vinyl aromatic monomer units, each E independently represents a homopolymer block of conjugated diene monomer units, each X independently represents a residue of a coupling agent, each m independently represents an integer of 2 or more, and each of n and p independently represents an integer of 1 or more, and

95 to 0 part by weight, relative to 100 parts by weight of the total of components (A) and (B), of (B) at least one polymer selected from the group consisting of an olefin polymer other than said hydrogenated copolymer (A) and a rubbery polymer other than said hydrogenated copolymer (A),

said hydrogenated copolymer (A) having the following characteristics (1) and (2):

(1) said hydrogenated copolymer (A) has a content of said vinyl aromatic monomer units of from more than 40 % by weight to 60 % by weight, based on the weight of said hydrogenated copolymer (A), and

(2) at least one peak of loss tangent (tanδ) is observed at -40 °C to lower than -10 °C in a dynamic viscoelastic spectrum obtained with respect to said hydrogenated copolymer (A),

said polymer foam having a specific gravity of from 0.05 to 0.5.

As seen from claim 1 reproduced above, the polymer foam of the present invention contains a hydrogenated copolymer (A) obtained by hydrogenating an unhydrogenated copolymer. The hydrogenated copolymer (A) has the following features (I) to (IV):

(I) The unhydrogenated copolymer from which the hydrogenated copolymer (A) is obtained by hydrogenation is a block copolymer containing at least one copolymer block S comprised of vinyl aromatic monomer units and conjugated diene monomer units and at least one homopolymer block H of vinyl aromatic monomer units, and has a specific block configuration, such as "H-S-H".

(II) The at least one copolymer block S has a vinyl bond content of from 5 % to less than 40 % as measured with respect to conjugated diene monomer units.

(III) The hydrogenated copolymer (A) has a content of the vinyl aromatic monomer units of from more than 40 % by weight to 60 % by weight, based on the weight of the hydrogenated copolymer (A).

(IV) At least one peak of loss tangent (tanδ) is observed at -40 °C to lower than -10 °C in a dynamic viscoelastic spectrum obtained with respect to the hydrogenated copolymer (A).

By the use of the hydrogenated copolymer having the above-mentioned features (I) to (IV), the polymer foam of the present invention exhibits excellent properties with respect to <u>all</u> of flexibility, low temperature characteristics (such as flexibility at low temperatures), shock-absorbing property (low impact resilience) and compression set resistance. The effect of the present invention is shown in the working examples of the present application.

It should be noted that, by the use of the hydrogenated copolymer (A) recited in claim 1, there can for the first time be obtained a polymer foam which exhibits excellent properties with respect to <u>all</u> of flexibility, low temperature characteristics (such as flexibility at low temperatures), shock-absorbing property (low impact resilience) and compression set resistance. In other words, if, for example, the hydrogenated copolymer does not have feature (IV) (i.e., feature on peak of loss tangent), the effects of the present invention can no longer be achieved. This was explained in detail in the Applicants' response of January 29, 2010, wherein the explanation was given with reference to accompany Exhibit 1, the YAHIRO Declaration. Accompanying Exhibit 1, the YAHIRO Declaration, also shows that a hydrogenated copolymer having features (I) to (III) does not always have feature (IV) and that, therefore, feature (IV) is never inherent to a polymer having features (I) to (III).

(II) Rejections based on prior art

In the outstanding Office Action, the claims are rejected over related art references. With respect to claim 1, this claim is rejected under 35 U.S.C. §103(a) as obvious over Holden et al. [US 3265765] (hereinafter referred to as "Holden '765") in view of Hawkins et al. [US 3935176] (hereinafter referred to as "Hawkins '176") (see item 4 appearing at pages 2-4 of the Office Action). The Applicants disagree with the Examiner and wish to traverse as follows.

Holden '765 is directed to an elastomeric block copolymer comprising vinyl aromatic monomer units and conjugated diene monomer units. In one embodiment of Holden '765, the block copolymer has a block configuration: A-C-A, wherein each A is a homopolymer block of styrene monomer units, and C is a copolymer block comprised of styrene monomer units and butadiene monomer units and contains an average of 10-40 wt % of styrene monomer units (see

column 2, line 62 to column 3, line 12; and column 4, lines 32-39 of Holden '765). The Examiner asserts that the polymer blocks A and C recited in Holden '765 respectively correspond to the polymer blocks S and H recited in claim 1 of the present application and that, therefore, the copolymer of Holden '765 corresponds to the unhydrogenated copolymer "H-S-H" recited in claim 1 of the present application.

However, Holden '765 not only is silent about hydrogenation of the polymer, but also has no teaching or suggestion about the vinyl bond content recited in feature (II) of the hydrogenated copolymer (A).

Also, Holden '765 has no teaching or suggestion about the peak of loss tangent of the polymer as referred to in feature (IV) of the hydrogenated copolymer (A).

Hawkins '176 discloses a thermoplastic elastomeric material comprising a hydrogenated copolymer obtained by hydrogenating an unhydrogenated random copolymer of at least one conjugated diene and at least one vinyl aromatic compound, wherein the unhydrogenated random copolymer has a vinyl aromatic monomer unit content (styrene content) within a specific range (see Abstract of Hawkins '176).

The hydrogenated copolymer recited in Hawkins '176 is completely different from the hydrogenated copolymer (A) recited in claim 1 of the present application. Specifically, for example, the copolymer before hydrogenation in Hawkins '176 is a <u>random copolymer</u>, whereas, as explained above, the copolymer before hydrogenation in the present invention is a <u>block copolymer</u> containing <u>not only</u> at least one copolymer block S comprised of vinyl aromatic monomer units and conjugated diene monomer units <u>but also</u> at least one homopolymer block H of vinyl aromatic monomer units. Therefore, the disclosure relating to the aromatic monomer unit content and the vinyl bond content in the <u>random</u> copolymer described in Hawkins '176 does not teach or suggest feature (II) or (III) of the hydrogenated copolymer (A) which is obtained by hydrogenating a specific <u>block</u> copolymer.

Also, Hawkins '176 has no teaching or suggestion about a peak of loss tangent of a polymer as referred to in feature (IV) of the hydrogenated copolymer (A).

Therefore, Holden '765 and Hawkins '176 do not have any teaching or suggestion about <u>at least</u> feature (II) (i.e., feature on vinyl bond content) and feature (IV) (i.e., feature on peak of loss tangent) of the hydrogenated copolymer (A). In this connection, it should be noted that, even if Holden '765 or Hawkins '176 has any teaching or suggestion about feature (II), this teaching or suggestion never gives any teaching or suggestion about feature (IV), because, as explained above, feature (IV) is never inherent to a polymer having features (I) to (III).

Further, Holden '765 and Hawkins '176 do not teach or suggest that, by the use of the hydrogenated copolymer (A) recited in claim 1 of the present application, there can for the first time be obtained a polymer foam which exhibits excellent properties with respect to all of flexibility, low temperature characteristics (such as flexibility at low temperatures), shock-absorbing property (low impact resilience) and compression set resistance. In this connection, it should be noted that these references do not refer to a peak of loss tangent of a polymer, let alone the effect achieved by controlling the peak of loss tangent within a specific range.

Therefore, it is apparent that Holden '765 and Hawkins '176 do not teach or suggest the present invention.

The Examiner asserts that the vinyl bond content of the conjugated diene portion in the copolymer block S, and other variables "are result-effective variables for desired properties for various end uses" and that "It would have been an obvious routine optimization to one of ordinary skill in the art to modify Holden's block copolymer according to Hawkins' teachings, i.e., hydrogenating the elastomeric block of workable amount of vinyl bond content, motivated by the desire to obtain improved properties" (see page 3, lines 6-21 of the Office Action). The Applicants disagree with the Examiner.

The MPEP stipulates that "a particular parameter <u>must first be recognized</u> as a result-effective variable, i.e., a variable which achieves a recognized result, <u>before</u> the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation" (emphasis added) (see MPEP §2144.05, II B). However, the Examiner fails to properly demonstrate that the variables referred to in Hawkins '176 are result-effective variables for achieving the effect of the present invention.

The properties desired to be achieved in Hawkins '176 are completely different from the properties desired to be achieved in the present invention. Specifically, Hawkins '176 intends to obtain a thermoplastic elastomeric material having good thermoplastic elastomeric properties, specifically, good tensile strength and good elongation set (see column 3, lines 15-25 and 44-54 and column 4, lines 5-25 of Hawkins '176). On the other hand, the present invention intends to obtain a polymer foam having excellent properties with respect to flexibility, low temperature characteristics (such as flexibility at low temperatures), shock-absorbing property (low impact resilience) and compression set resistance. For example, the present invention manipulates the vinyl bond content to impart excellent shock-absorbing property (low impact resilience) to the polymer foam (see page 32, line 4-19 of the present specification).

Therefore, the desired ranges for the vinyl bond content and other variables would naturally be different between the Hawkins '176 and the present invention. Thus, the variables (such as vinyl bond content) referred to in Hawkins '176 are not result-effective variables for achieving the effect of the present invention.

To understand why the Examiner's argument is legally unsupported, the Examiner is requested to consider the following analogy. Assume applicants claimed an automotive race tire having a specific rubber softness. Assume further that a prior art reference disclosed long-lasting automotive tires, and did not disclose the specific rubber softness required by the claim.[1] However, this assumed reference described how to manipulate rubber softness to extend the life of the tire. Certainly, the results produced by a road-gripping race tire are dramatically different from the results produced by a long-lasting tire. It is irrelevant if the long-lasting tire reference mentions varying the rubber softness. The two tires would not have the same rubber softness. The claim is not anticipated by or rendered obvious in view of the reference.

Further, the Examiner's attention is drawn to a paper titled "The Rise of the Result-Effective Variable" by Moshe K. Wilensky, which was submitted as "Exhibit 2" in the Applicants' response of January 29, 2010. As explained in the Applicants' response of January 29, 2010, the Wilensky document explains result-effective variables in depth (see heading "What Is a Result-Effective Variable Rejection?" appearing at page 42 of the Wilensky document), and explains their relationship to the prima facie case of obviousness (see heading "Traversing Result-Effective Variable Rejections Based on Current Precedent" appearing at page 43 of the Wilensky document). The Wilensky document also cites two examples of recent USPTO rejections that improperly asserted that a feature was a result-effective variable (see Examples 1 and 2 appearing at page 43 of the Wilensky document). It is believed that the Wilensky document supports the Applicants' argument.

From the above, it is apparent that the polymer foam of claim 1 of the present application has patentability over Holden '765 and Hawkins '176.

Now that the patentability of claim 1 over the prior art references has been established, the patentability of the remaining claims over the prior art references is also apparent. Withdrawal of the rejections is requested.

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[1] The Examiner makes no assertion that the claimed vinyl content is taught in Hawkins et al.

(III) Conclusion

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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